

APPLE (*Malus domestica* 'Rome')  
Powdery Mildew; *Podosphaera leucotricha*

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### **Evaluation of soil injected fungicide for management of apple diseases, 2020-2021.**

This trial was conducted at the Botany and Plant Pathology Field Laboratory in an apple orchard planted on a Camas gravelly sandy loam soil type. Fungicide treatments were arranged in a randomized complete block design in a block of 'Rome' apples on M-7 rootstock planted in 1979 on 20 x 20 ft spacing. Each treatment consisted of 5 single tree replicates. The diameter of trees 8 inches above ground was determined mid-Oct 2020. The fungicide RTSA 504 was injected into the soil around trees using an HTI 2000 Soil Injector connected to a Maruyama MS75 backpack power sprayer. The nozzle end of the injector was inserted 4 inches into the soil prior to horizontal injection of the fungicide solution. The amount of fungicide solution injected was based on the diameter of each tree where 250 ml of solution was injected per inch diameter. For example, 11 separate injection sites were evenly distributed within the drip zone of a tree 11 inches in diameter. Fall injections occurred on 22 Oct 2020 (leaves still on tree) and spring injections occurred 21 Apr 2021 (pink) and 6 May 2021 (late bloom). Fungicide solution emerged from about half the injection sites (through cracks and earthworm middens) during application and puddled on the ground. The fungicide Banner Maxx II was foliar applied using a hydraulic handgun sprayer at 100 psi, such that 5 to 6 gal of a spray suspension was applied per 5 trees (136 to 163 gal water/A). Foliar sprays were applied on 23 Apr (pink), 5 May (full bloom to petal fall), 20 May (1<sup>st</sup> cover), 4 Jun (2<sup>nd</sup> cover), 17 Jun (3<sup>rd</sup> cover) and 2 Jul (4<sup>th</sup> cover). Trees were pruned 27 Jan 2021. No fertilizer was spread within tree rows. A dormant oil spray of Omni supreme-oil (1.5 gal/A) was applied on 9 Feb for aphid management. Assail 70 WP (3 oz/A) was applied 11 May for aphid and codling moth management. Insecticide sprays were applied to the entire block using a Rear's air blast speed sprayer. Makaze (64 fl oz/A) and Goal XL (40 fl oz/A) were applied on 20 Jan and 12 Mar for weed control. Apple scab infection periods were monitored using an Meter ATMOS 41 All-In-One weather station equipped with standard sensors and a ZL6 data logger. Using a modified primary infection model (wet periods start with rain and end with 8 hr drying time), a total of 5 infection periods were detected from mid-Apr through Jun: 2 high infection periods (24 May and 12 Jun), 1 moderate infection period (11 Jun) and 2 low infection periods (24 and 30 Apr). The incidence of powdery mildew on leaves was determined on 14 and 15 Jul, by examining all leaves from 20 arbitrarily selected vegetative shoots (316 to 494 leaves for an average of 429) from each tree. Incidence of fruit russet was determined on 2 and 3 Aug by examining up to 100 fruit (40 to 100 fruit for an average of 90) arbitrarily selected from each tree.

Rainfall for the dormant season (Oct 2020 to March 2021) was close to normal but spring rainfall was the second lowest ever recorded. Although a nearby TEROS 11 soil sensor measured 23% soil water content during the fall injection and 26 to 27% during the spring injections, soil conditions were considered very dry. An unusual climate change related heat dome (heat wave) occurred for 3 days in late June with temperatures reaching 107°F on 27 June. Only minor amounts of apple scab were observed in this and nearby apple blocks. Shoots covered with powdery mildew due to infection the previous year were first observed on 23 Apr and increased during the growing season. The amount of powdery mildew found on non-treated trees was not significantly different from powdery mildew found on any of the trees treated with soil injection. Lowest amount of powdery mildew or fruit russet was found on trees treated with Banner Maxx II which was significantly lower than powdery mildew or fruit russet found on all other trees. Phytotoxicity was not observed on any treated trees.

Future trials may need to consider the soil water status *prior* to injection. Injections may need to be done shortly *after* significant rain or irrigation. Rain or irrigation shortly after injection may also be an important factor for chemical uptake although there was 0.34 inches after the first spring injection.

Treatment & Rate/A or /100 gal as indicated below	Time of Application*	Ave. Tree Diameter (inches)**	Powdery Mildew Leaves (%)**	Fruit Russet (%)**
Non-treated.....	None.....	10.8	82.6 a	20.5 a
RTSA 504 at 10 ml/injection.....	Fall.....	10.7	82.0 a	20.8 a
RTSA 504 at 5 ml/injection.....	Fall and Bud Break	9.9	81.2 a	16.6 a
RTSA 504 at 5 ml/injection.....	Bud Break...	11.0	79.4 a	20.8 a
RTSA 504 at 10 ml/injection.....	Bud Break...	10.5	80.3 a	21.9 a
RTSA 504 at 5 ml/injection.....	Bud Break and 2 weeks later	11.7	78.6 a	22.6 a
Banner Maxx II at 4 fl oz/100 gal.....	All foliar apps	10.8	4.3 b	6.6 b

\* Fall injections occurred on 22 Oct 2020 (leaves still on tree) and spring injections occurred 21 Apr 2021 (pink) and 6 May 2021 (late bloom). The fungicide Banner Maxx II was foliar applied on 23 Apr (pink), 5 May (full bloom to petal fall), 20 May (1<sup>st</sup> cover), 4 Jun (2<sup>nd</sup> cover), 17 Jun (3<sup>rd</sup> cover) and 2 Jul (4<sup>th</sup> cover).

\*\*Means followed by the same letter do not differ significantly based on Fisher's protected LSD ( $P=0.05$ ). Means without letters were not different.